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A Revision of the North American Species of Fissidens.*—I.

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After examining critically the North American species of Fissidenteæ, I conclude that the group as elaborated in the Manual of Mosses of North America, by Lesquereux and James, includes too many nominal species, and that it would be better to combine some forms which have been separated as poorly defined species. In this revision I attempt to make the distinctions between species more nearly equivalent to those which the best systematists demand between species of phanerogams. The descriptions of the Manual are necessarily condensed and are not clearly diagnostic. I therefore present complete descriptions so far as material at hand permits, and embody the most obvious diagnostic characters in a synoptical key. I also offer some critical remarks upon difficult, doubtful or excluded species.

For the synonymy of all species occurring in Great Britain, I refer to Braithwaite's British Moss-Flora, and supply only references to American works and collections. In species not British full synonymy is given.

In description I have substituted *leaf-cells* for the unmeaning term "areolation," and *rhizoids* for "radicles." I use the terms *vaginant lamina*, *vertical lamina* and *inferior lamina* to designate respectively the sheathing or conduplicate portion of the leaf, the whole of the vertical blade, and the part of it below the costa.

Whenever possible, I include in the descriptions measurements of the leaf-cells of the vertical lamina and of the spores, instead of the indefinite expressions "large" or "small." Measurements of height are in all cases exclusive of the fruit.

* Read before the A. A. A. S., Buffalo meeting, August, 1886.

FISSIDENS Hedwig.

Fissidens Hedwig: Fund. Musc. 2. 91. — Sullivant: Mosses of U. S. 24. — Lesq. & James: Man. 81.
Dicranum Auct.
Skitophyllum De la Pylaie: Desv. Jour. Bot. 6, 133.
Schistophyllum Lindberg.
Octodiceras Bridel.: Sp. Musc. 1. 162.
Conomitrium Montagne: Ann. Sci. Nat. II. 8. 245.—Sullivant: Mosses of U. S. 25.— Lesq. & James: Man. 89.

Plants large or small, simple or branched, gregarious or cespitose, terrestrial or aquatic: leaves distichous, conduplicate below, often equitant and clasping, the back produced into a prominent vertical wing with a sub-percurrent or excurrent costa; cells parenchymatous, all chlorophyllose: flowers monoicous, pseudo-dioicous or dioicous: fruit terminal or lateral; pedicel usually long; teeth sixteen, long, deeply bifid with the unequal divisions rough, or short and perforate; calyptra cucullate, mitrate or conic; operculum conic or rostrate.

Habitat: On the ground, rocks or trees, or in water; in all parts of the world but chiefly tropical, not alpine.

A very large genus of over three hundred described species, represented in North America by twenty species, which may be characterized and arranged in a fairly natural order as follows:

§ 1. **Eufissidens** Müller: Syn. Musc. 1. 50. — Plants terrestrial or submersed but not floating: leaves soft, of one layer of cells.

* *Fruit terminal.*

+– *Monoicous, male flowers axillary.*

Leaf-cells small, densely chlorophyllose, in distinct rows 1. **limbatus.**
Leaf-cells larger, not densely chlorophyllose, nor in distinct rows. . . . . 2. **bryoides.**

+– +– *Dioicous or monoicous with the male flowers terminal on a rooting branch at the base of the female stem.*

++ *Leaf-cells 1½–2 times as long as wide, large, distinct.*

Plants less than 1 mm. high, leaves 2 or 3 pairs . . 3. **Closteri.**
Plants 2–4 mm. high, wholly hyaline, leaves 3–5 pairs . 4. **hyalinus.**

++ ++ *Leaf-cells almost or quite isodiametric, often obscure.*

¶ *Leaves with a narrow border, at least on vaginant lamina.*

Marginal leaf-cells not papillose . . . . . 5. **incurvus.**
Marginal leaf-cells papillose.
Costa percurrent . . . . . 6. **Ravenelii.**
Costa ceasing below apex . . . . . 7. **Garberi.**

¶¶ *Leaves without a border.*

Acute, cells densely chlorophyllose, obscurely papillose . 8. **Donnellii.**

Obtuse, cells pellucid, operculum conic . . . . 9. **obtusifolius.**
Apiculate, operculum with acicular beak . . . 10. **osmundoides.**

¶¶¶ *Leaves with a thick reddish border.*

Plants submersed, rigid . . . . . 11. **rufulus.**

** *Fruit lateral.*

+– *Leaves without a border.*

Obtuse, entire, plants 2–5 cm. high, fruit sub-terminal . 12. **polypodioides.**
Rounded at apex, irregularly serrate, 1–2 cm. high, fruit sub-basal . . . . . 13. **sub-basilaris.**
Mucronate, regularly serrulate, fruit basal or sub basal . 14. **taxifolius.**

+– +– *Leaves bordered by several rows of paler, often incrassate, cells.*

Capsule cernuous, leaf-cells minute . . . . 15. **Floridanus.**
Capsule erect or inclined, flowers dioicous, leaf-cells obscure . . . . . 16. **decipiens.**
Capsule erect or inclined, flowers monoicous, leaf-cells distinct . . . . . 17. **adiantoides.**

§ 2. **Pachyfissidens** MULLER: Syn. Musc. 1. 45.—Leaves rigid, composed of more than one layer of cells, opaque.
Plants growing in water or very wet places . . . 18. **grandifrons.**

§ 3. **Octodiceras** BRIDEL: Sp. Musc. 1. 162.—Plants aquatic, filiform, floating.
Plants large, much branched, pedicel shorter than the capsule . . . . . 19. **Julianus.**
Plants small, little branched, pedicel longer than the capsule . . . . . 20. **Hallianus.**

1. F. limbatus SULLIVANT: Pac. R. R. Rept. 4. 185. t. 1.

LESQUEREUX: Trans. Am. Phil. Soc. 13. 3.—Mem. Cal. Acad. 1. 7.—BOLANDER: Cat. 37.—WATSON: Bot. Calif. 2. 374.—LESQ. & JAMES: Man. 82.—MITTEN: Jour. Linn. Soc. 21. 556.

COLL.: SULL. & LESQ. Musci Bor. Am. 2 ed. 105.

Plants small, 2—5 mm., yellowish green or in wet places bright green, gregarious: stem simple: leaves on sterile plants 8–12 pairs (on fertile plants fewer), oblong lanceolate, apiculate or somewhat acuminate; border hyaline, widening from apex to base except on inferior lamina, very wide at base of vaginant lamina; costa thick, sub-percurrent; cells small, 8–12×12 μ, arranged in rows, densely chlorophyllose, sub-quadrate, more irregular in vaginant lamina, which is one-half to three fourths the length of leaf: flowers monoicous; male gemmiform, axillary; female terminal: fruit terminal; pedicel 6–10 mm. long, flexuous, yellowish-red; capsule green, sub-oval, unsymmetric, cernuous; teeth red, inserted below the mouth, much introflexed, deeply split; lid red, conic-rostrate, one-half length of capsule; spores 12–16 μ, usually 14 μ.

HAB.: California; near San Francisco (*Bigelow, Bolander*); San Gabriel and Pasadena (*Allen*).

2. F. bryoides HEDWIG: Musc. Frond. 3. 67. t. 29.

BRAITHWAITE: Br. Moss-Fl. 1. 71. t. 10 E.—SULLIVANT: Mosses U. S. 24.—LESQ. & JAMES: Man. 81.—MITTEN: Jour. Linn. Soc. 21. 554.

COLL.: DRUMMOND: Musci Am. I. no. 113 in part.—SULLIVANT: Musci All. no. 185.—SULL. & LESQ.: Musci Bor. Am. 1 ed. no. 82.

Plants small, gregarious or somewhat cespitose: stems simple or fasciculate at the base, ascending: leaves 3-many pairs, rather remote, lanceolate or oblong lanceolate, abruptly apiculate; border thickish, pale, usually confluent with the excurrent costa; vaginant lamina one-half length with broader border, inferior lamina narrowed and decurrent; cells roundish-hexagonal, distinct, 12–16×16–20 μ, in vaginant lamina 14–20×20–24 μ: flowers monoicous; male numerous, axillary, gemmiform, pedicellate, antheridia few, small; female terminal, vaginant lamina of perigonial leaves broadly ovate, erose, that of the perichætial leaves with a broad border: fruit terminal; seta red or purplish, 4–6 mm. long; capsule erect, oval or elliptical, brown; teeth cleft one-half length, divisions very scabrous: operculum conic rostrate, short, red; calyptra cucullate; spores 20–26 μ.

HAB: On the ground: Canada (*Macoun*); New York (*Barron, Peck*); New Jersey (*Austin*); Columbus and Cincinnati, Ohio (*Sullivant*); Rocky Mts. (*Drummond*); Sierras (*Lemmon*).

Var. **cæspitans** SCHIMPER: Syn. Musc. 2 ed. 111.

BRAITHWAITE: Br. Moss-Fl. 1. 72.—LESQ. & JAMES: Man. 82.
F. Curnovii MITTEN: Jour. Linn. Soc. 21. 556.

Plants 2–3 cm. high, more robust than the species, loosely cespitose in broad soft tufts, pale green: stems branching sparsely by innovations, interwoven by rufous purple rhizoids: leaves with a prominent border ceasing at the minutely serrulate apiculus: capsule pale.

HAB.: Wet rocks, New River, White Mts., N. H. (*Prof. O. D. Allen*).

3. F. Closteri AUSTIN: Bull. Torr. Bot. Club 5. 21.

SULLIVANT: Icon. Musc. Suppl. 44. t. 29.—LESQ. & JAMES: Man. 81.—MITTEN: Jour. Linn. Soc. 21. 558.

COLL: AUSTIN: Musci App. Suppl. no. 479.

Plants very minute and almost stemless, less than 1 mm. high, gregarious: leaves two or three pairs, the lower smaller, broad ovate, the upper two or three times longer; border none; vaginant lamina ovate, one-half length, apical lamina narrow; costa strong, ceasing below the apex; cells rectangular, more or less irregular at margin and near apex, 8×15–20 μ, those of the vaginant lamina 14–16×20–40 μ: flowers monoicous or pseudo dioicous; male gemmiform, attached to the female by rhizoids or separate, antheridium single: fruit terminal; capsule erect,

oblong, tapering gradually to the thick seta 1.5 mm. long; operculum conic-rostrate, the beak only covered by the conic calyptra; teeth when dry strongly reflexed around the flaring mouth; spores 8–12 μ.

HAB.: On the ground: Closter, N. J. (*Austin*).

4. F. hyalinus WILSON & HOOKER: Jour. Bot. 1841. 89. t. 2.

SULLIVANT: Mosses U. S. 24.—Icon. Musc. 34. t. 21.—LESQ. & JAMES: Man. 84.—MITTEN: Jour. Linn. Soc. 21. 558.

COLL.: SULLIVANT: Musci. All. no. 180.

Plants minute, 2–4 mm. high, pale green, whole plant more or less hyaline, gregarious: stem simple or branched at the base: leaves 3–5 pairs, upper much larger, very thin and soft, oblong-lanceolate, acute, entire, bordered by a single row of very narrow elongate cells; costa none: vaginant lamina less than one-half length; cells large, 32–48×68–100 μ, thin-walled, elongate-hexagonal, chlorophyll bodies few: flowers dioicous; male unknown; female terminal, two-leaved: fruit terminal; seta 1–2 mm. long; capsule oblong-oval, erect, thin; teeth closely articulate, cleft to middle; operculum rostrate, calyptra covering the beak only; spores 14–20 μ.

HAB.: Rocky ledges at Bank Lick, near Cincinnati, Ohio (*Lea*, 1839; station lost); on ground in deep ravines near Painesville, Ohio (*Beardslee*).

5. F. incurvus SCHWÄGRICHEN: Suppl. I, part 1. t. 49.

BRAITHWAITE: Br. Moss-Fl. 1. 69. t. 10 C.—JAMES: Trans. Am. Phil. Soc. 13. 109.—LESQ. & JAMES: Man. 82.—MITTEN: Jour. Linn. Soc. 21. 557.

COLL.: SULL. & LESQ.: Musci Bor. Am. 2 ed. no. 104.—AUSTIN: Musci App. no. 101, in part.

Plants small, 2–5 mm. high, gregarious or sub cespitose: stem simple, slender, ascending: leaves 4–10 pairs, straight or decurved, not imbricate, oblong-lanceolate to linear-lanceolate, apiculate; border narrow, almost or quite wanting at apex, widening at base; costa percurrent or sub-percurrent; vaginant lamina one-half length or more; inferior lamina narrowed to the base; cells small, 12–14×14–19 μ, angular-rounded, of the same size but more irregular in vaginant lamina: flowers monoicous; male gemmiform, at the base of stems from which they sometimes separate (pseudo-dioicous): fruit terminal; seta long, red, flexuous; capsule thick, oval, erect, cernuous or arcuate-incurved, pale brown; operculum prominent, conic-rostrate, red; teeth not deeply inserted, very scabrous; calyptra pale; spores 13–17 μ.

HAB.: On rocks, especially sandstone; not rare in Canada and states east of the Mississippi river; collected also in Texas (*Hall*) and Vancouver Is. (*Macoun*).

Var. **minutulus** AUSTIN: Musci App. n. 102.

F. minutulus SULLIVANT: Musci All. no. 183.—Mem. Am. Acad. n. s. 3. 58. t. 2 A.—Mosses U. S. 24.—Icon. Musc. 37. t. 24.—LESQ. & JAMES: Man. 85.—MITTEN: Jour. Linn. Soc. 21. 556.

COLL.: HOOKER & WILSON: Drum. Musci Am. II. nos. 39, 40. (*fide* Sulliv. ms.)—SULLIVANT: Musci All. no. 183.—SULL. & LESQ.: Musci Bor. Am. 1 ed. no. 80 in part.—AUSTIN: Musci App. no. 102.

Plants minute: 1 mm. or less high: leaves narrowly oblong-lanceolate, undulate; some or all narrowly bordered: capsule thin, erect or inclined.

HAB.: On rocks; widely distributed in the Eastern States and Canada; collected also in California (*Mrs. S. R. Mann*).

Var. **exiguus** AUSTIN: Musci App. no. 103.

F. exiguus SULLIVANT: Mem. Amer. Acad. n. s. 3. 60. t. 2 B.—Mosses U. S. 24.—Icon. Musc. 36. t. 23.—LESQ & JAMES: Man. 84.—MITTEN: Jour. Linn. Soc. 21. 557.

COLL.: SULL. & LESQ.; Musci Bor. Am. 1 ed. nos. 79, and 80 in part.—AUSTIN: Musci, App. no. 103.

Plants small: leaves without border except on vaginant lamina: capsule erect or inclined; operculum conic-rostellate.

HAB.: On rocks, Canada, central and eastern States: Colorado (*Brandegee*).

6. F. Ravenelii SULLIVANT: Mem. Amer. Acad. n. s. 4. 171. t. 2.

SULLIVANT: Mosses U. S. 24.—Icon. Musc. 39. t. 25.—LESQ. & JAMES. Man. 85.—MITTEN: Jour. Linn. Soc. 21. 557.

COLL.: SULL. & LESQ. Musci Bor. Am. 1 ed. no. 81.—2 ed. no. 102.—AUSTIN: Musci App. Suppl. no. 481.

Plants minute, 2–4 mm high, yellowish or dirty-green, gregarious: stem simple: leaves 2–10 pairs,[1] oblong-lanceolate, acute, minutely-denticulate; border none except in the vaginant lamina of the upper leaves of fertile stems where it is broad, prominently and irregularly dentate; costa flexuous, hyaline, percurrent; vaginant lamina one-half length; inferior lamina tapering, reaching the base; cells very small, 8 μ, obscure, round quadrate, minutely papillose, each with about two papillæ: flowers dioicous; male plants very small, with 2–3 pairs of leaves; female plants rarely with more than 6 pairs: fruit terminal; seta 4–5 mm. long, yellowish; capsule oval or oblong, when dry urceolate, the cells protuberant; operculum red at base, with a short, inclined beak; spores 10–13 μ.

HAB.: On damp bricks or on the ground in wet places: Society Hill, N. C. (*Curtis*); Charleston, S. C. (*Ravenel*); Magnolia, Fla. (*J. Donnell Smith*).

7. F. Garberi LESQ. & JAMES: Proc. Amer. Acad. 14. 137.

AUSTIN: Bull. Torr. Bot. Club 7. 5.—LESQ. & JAMES: Man. 86.—MITTEN: Jour. Linn. Soc. 21. 558.

Plants minute, 1–3 mm. high, bright green, gregarious: stem simple, rarely dichotomous: leaves 4–8 pairs, sometimes falcate, oblong, obtuse, rarely short-acuminate, the upper four times longer than broad,

[1] SULLIVANT says (Icon. Musc. 39): "7—15 (18—20 in sterile stems)," but does not figure any plants with more than eight. Cf. Icon. Musc. t. 25, Mem. Amer. Acad. n. ser. 4. t.

margin minutely denticulate with doubly papillose cells; border none, except on the lower half of the vaginant lamina of the perichætial leaves, where it begins abruptly and consists of two or three rows of larger, rectangular-rhomboidal cells; costa flexuous, hyaline, ceasing below apex; vaginant lamina one-half length; inferior lamina tapering to the base; cells small, 6–8 μ, obscure, round-quadrate to round-hexagonal; flowers terminal, probably dioicous or pseudo-dioicous: fruit terminal; seta equaling or exceeding the stems; capsule erect or sub-erect, elliptical, pale brown, red at the orifice; teeth densely articulate, rufous at base, divisions yellowish; operculum conic-rostrate.

HAB.: On trees, rotten wood, rocks and shells: Florida (*Garber, J. Donnell Smith, Austin*).

8. F. Donnellii AUSTIN: Bot. Gaz. 4. 151.

LESQ. & JAMES: Man. 85.—MITTEN: Jour. Linn. Soc. 21. 557.

Plants minute, 2–3 mm. high, dark green, gregarious: stem simple: leaves 3 or 4 pairs, the lower oblong-ovate, the upper much elongated, narrowly lanceolate, crenulate-serrate; border none; costa ceasing just below apex; vaginant lamina one-half length; inferior lamina tapering and ceasing before reaching base, or reduced to a mere line; cells small, 12–16 μ, angular and irregular, each with a single obscure papilla: flowers dioicious, terminal; antheridia 4–6, paraphysate; archegonia unknown: fruit terminal; seta very short; capsule unknown.

HAB.: Base of a cypress tree in a swamp, Caloosa, Fla. (*J. Donnel: Smith, Austin*).

9. F. obtusifolius WILSON: Lond. Jour. Bot. (1845) 4. 196. t. 9.

SULLIVANT: Mosses U. S. 24.—Icon. Musc. 35. t. 22.—LESQ. & JAMES: Man. 86.—MITTEN: Jour. Linn. Soc. 21. 558.

COLL.: SULLIVANT: Musci All. no. 181.—SULL. & LESQ.: Musci Bor. Am. 1 ed. no. 78.—2 ed. no. 99.—AUSTIN: Musci App. Suppl. no. 486.

Plants small, densely gregarious, bright green: stems simple or branched, sometimes with an innovation just below seta, fertile 1–2 mm. high, sterile longer: leaves 4–12 pairs (the fertile stems with rarely more than 6), the lower oval, the upper oval-oblong, obtuse, entire; border none; costa barely reaching the apex, or vanishing below it; vaginant lamina two-thirds length; inferior lamina tapering and ending above base; cells pellucid, round hexagonal, distinct, 10–14 μ: flowers dioicous, terminal; antheridia 4–6, paraphyses few: fruit terminal; seta light yellow, 2–3 mm. long; capsule thick, oblong, obconic at base; teeth short, orange below, divisions hyaline, granulose; operculum conic, beak very short; spores large, 20–26 μ.

HAB.: On wet rocks or stones: Holmesburg, Pa. (*James*); Ohio, Cincinnati (*Lea*), Sugar Grove (*Sullivant*), Clifton, Clarke county, (*James*); Canton, Ill. (*Wolf*); Texas (*Hall*).

10. F. osmundoides HEDWIG: Sp: Musc. 153. t. 40.

BRAITHWAITE: Br. Moss-Fl. 1. 73. t. 11 A.—SULLIVANT: Mosses U. S. 24.—LESQ. & JAMES: Man. 87.—MITTEN: Jour. Linn. Soc. 21. 558.

COLL.: DRUMMOND: Musci Amer. I. no. 112.—SULLIVANT: Musci All. no. 179.—SULL. & LESQ.: Musci Bor. Am. 1 ed. no. 86.—2 ed. no. 109.—AUSTIN: Musci App. no. 104.

Plants of medium size, 1–5 cm. (rarely even 8–10 cm.) high, more or less densely tufted, frequently matted by the brown tomentose rhizoids, olive- or dark-green: stems simple or branched below: leaves numerous, approximate, not imbricated, increasing in size toward the apex of stem, sometimes crisped when dry, oblong-lanceolate, serrulate especially towards the apex; border none; costa vanishing just below the rounded, apiculate apex; vaginant lamina $\frac{1}{2}$–$\frac{2}{3}$ length; inferior lamina narrowing slightly toward the base, not decurrent; cells large, 12–24 × 16–32 μ, oval-hexagonal: flowers dioicous, terminal: fruit terminal; seta yellowish to dark-red, $\frac{1}{2}$–1 cm. long; capsule sub-erect or inclined, light- to red-brown, oblong; the conical operculum with its long, acicular, straight (rarely bent) beak equaling the capsule; calyptra plurilobate at base; spores 20–28 μ.

HAB.: Common in all situations: Lower Canada, Eastern and Central States; White Fish Bay, Lake Superior (*Gillman*); Grandfather Mt. (*Sullivant*); Rocky Mts. (*Drummond*).

11. F. rufulus BRUCH & SCHIMPER: Bry. Eu. Fiss. Monog. Suppl. II. t. 102.

SCHIMPER: Syn. Musc. 1 ed. 106.—2 ed. 120.—MILDE: Bry. Siles. 84.—BRAITHWAITE: Br. Moss-Fl. 1. 74. t. 11 B.

F. ventricosus LESQUEREUX: Mem. Cal. Acad. 1. 7.—SULLIVANT: Icon. Musc: Suppl. 45. t. 30.—WATSON: Bot. Calif. 2. 374.—LESQ. & JAMES: Man. 84.—MITTEN: Jour. Linn. Soc. 21. 556.

Plants large, robust, 2–5 cm. high, loosely and widely cespitose, blackish below, the young branches dark green: stem erect, branching dichotomously at the base, the branches simple or sparingly divided, with rhizoids among the leaves: leaves numerous, crowded, somewhat imbricate, cultriform or scalpelliform, entire; border thick, reddish, ceasing just below the apex; costa strong, percurrent; vaginant lamina $\frac{1}{2}$–$\frac{2}{3}$ length, ventricose, margin flexuous near apex; inferior lamina tapering regularly to the base; cells thick-walled, polygonal, 8–12 × 8–16 μ: flowers dioicous, terminal; male plants shorter: fruit terminal; seta short, scarcely exceeding the leaves, thick; capsule thick, erect, elliptical, pale below, reddish above; teeth erect, coarsely articulated, upper portions spirally thickened; operculum short-conic; calyptra cucullate; spores oval, large, 24–32 μ.

HAB.: On submerged rocks in streams: Mendocino City, Cal. (*Bolander*); Silver Creek, Oregon (*Hall*).

Columbia College Herbaria.[1]

N. L. BRITTON.

The botanical collections of Columbia College have been accumulating since about the year 1820, a few specimens indeed bearing still earlier dates. These oldest were among the first plants collected by Dr. Torrey, and were the nucleus of the Torrey herbarium. During Dr. Torrey's connection with the College, from 1860 to his death, in 1873, specimens accumulated very rapidly, but were nearly all classified by him and mounted under his direction. In 1874 the very extensive collection of the late Professor Meisner, of Basle, Switzerland, specially rich in South American, Asiatic and Australian species, and supplementing the Torrey herbarium to a remarkable degree, together with the herbarium of Dr. A. W. Chapman, of Florida, containing nearly all species described in the "Flora of the Southern United States," were purchased by Mr. John J. Crooke, of New York, and presented to the college. At this time and until about three years ago the collections were under the care of Mr. P. V. LeRoy, who acted as curator. Nearly all his time was spent in mounting the Chapman and Meisner herbaria, and other specimens obtained through purchase or exchange. About two years since the personal bryological collection of the late Mr. C. F. Austin was purchased. It contains all of Austin's types of mosses and some of his Hepaticæ, though unfortunately the bulk of his hepatological material was allowed to leave the country.

Until the autumn of 1878 the college herbarium was located in a building on Madison avenue, which was occupied also by several of the professors. This was at that time torn down and replaced by a new building erected for the department of arts, and the botanical collections were transferred to another old building, where they remained until last autumn. Neither of these ancient edifices were fire-proof. Indeed, it was well known that nothing could save them in case of fire, and the utmost anxiety was felt by those who had the preservation of the vast botanical collections at heart.

On the completion, last year, of the new library building, one of its rooms was assigned to the botanical department. Its furniture was completed in November last, and the task

[1]Read before the Botanical Club of the A. A. A. S., Buffalo meeting, 1886.

of transferring the herbaria was at once begun, and is now practically completed, though much work in arranging and distributing specimens is yet to be done, and for the first time these invaluable scientific collections are secure. It is too soon to say that this disposition will be final. It isolates the plants from the other natural history collections in the museum building on Fourth avenue, and when this shall have been extended it may be deemed wise to deposit the herbaria in the extension, and thus bring them close to the museums of geology and palæontology containing Professor Newberry's immense collections in palæo-botany. The present disposition makes them absolutely secure from fire, which is a source of great satisfaction.

The room now devoted to the botanical collections is sixty feet long, twenty-two feet wide, and sixteen feet in height. It is lighted by day through large, high windows at each end, by the incandescent electric light during evenings and gloomy weather, being an expansion of the system used throughout the library and law school. The herbarium may be consulted till 10 o'clock every evening throughout the year excepting Sundays. The collections, comprising the Torrey, Meisner, and Chapman herbaria, Austin's mosses, and a mass of miscellaneous material, make in all about 175,000 mounted sheets, representing not less than 70,000 species, of which some 6,000 are cryptogams. To accommodate them are 174 running feet of cases, seven feet high, so that any specimen may be reached from the floor without a step-ladder. The cases are of polished oak, handsomely finished and varnished. Each has two plate glass doors opening the entire height, secured by the Jenks' lock and fitting very closely to exclude dust. There are forty-eight compartments to a case, each six inches in height in the clear, separated vertically and laterally by one-half inch oak boards. This height gives the greatest economy of room consistent with stacking the specimens without fear of damaging them. In all there are 1,728 compartments. I find that on the average each will comfortably accommodate about 150 mounted sheets, including genus and species covers, and the present cases on this estimate provide space for about 260,000 sheets, and by crowding, about 300,000. Should the herbarium remain in this room and outgrow this number, there is space in the upper part of the room for an equal number of cases, constructed on those now in place, which are strong enough for this arrangement. In the botanical arrangement, the sequence of orders and genera of Phanero-

gamia strictly follows that of Bentham and Hooker's "Genera Plantarum." The arrangement of species is geographical, and all the American ones are put in special genus and species covers and placed alphabetically. If there are specimens of plants native or naturalized in America, from other regions, they are put in the same cover as the American specimens for comparison. American genera of more than four species are given species covers and the genus cover dispensed with; genera of four or a less number of species are placed in a single genus cover. It may be objected that the alphabetical arrangement is unscientific, as it destroys natural relationships, but the advantage of easy reference overbalances this disadvantage, and while studying a genus it is a small undertaking to group the species temporarily in any desired order. The arrangement of genera of the cryptogamous groups is also alphabetical, and the American species are similarly distributed. Each second or third compartment is supplied with a pasteboard cover, hinged so as to drop down over the exposed ends of the sheets. To this is attached the name of the order, printed in large, black letters, and the names of genera to be found in the compartments. As the fronts of the cases are glass, it may be seen exactly where any genus is located before opening the door. After much hesitation it has been determined to unite all the separate collections into a single great botanical series. This brings all the specimens of a kind together, and appears to be the most advantageous arrangement. As it is important, however, to know the origin of each specimen, each sheet is appropriately stamped, and the Torrey herbarium, in particular, is carefully identified.

The botanical library is placed around the walls at one end of the room; it comprises about 2,000 bound volumes and an equal number of pamphlets, and is rapidly increasing in bulk. Books on general science, such as the *American Journal of Science*, etc., are on the main college library floor, but can be obtained in five minutes through the aid of a telephone, a page and an elevator. Woods, fruits and miscellaneous botanical material, microscopical preparations, etc., are placed in drawers or in wall cases. Large working tables in each end of the room complete the equipment.

Notes on Umbelliferæ of E. United States. I.

JOHN M. COULTER AND J. N. ROSE.

(WITH PLATE I.)

Our species of Umbelliferæ have always been more or less perplexing, chiefly on account of the attempt to discriminate them without mature fruit. For this reason, it has seemed to us a helpful thing to take up certain Umbelliferæ and present characters that can be used with reasonable certainty. It is well known that the best characters are obtained from the mature fruit, hence it is safe to give as general advice that no attempt be made to determine species of Umbelliferæ in its absence. Of course there are certain forms that can be recognized without fruit, but the rule holds good. The fruit should be examined both as to its surface and transverse section, and these taken together furnish reliable characters. It hardly needs to be said that the fruit is made up of two carpels and that it is superficially marked by more or less prominent ribs. Five ribs is the normal number for each carpel, one being dorsal (the commissural side being ventral), two lateral (nearest the commissural side), and two intermediate. These ribs may be connected by reticulations or not, may be developed into prominent wings or corky ridges, or may be suppressed entirely. Secondary ribs may also be developed in the intervals between the five primary ribs. Thin transverse sections should be made as near the middle of the carpel as possible, and the varying number, position and size of the oil-ducts, the outline of the seed section, the nature of the pericarp, and the rib sections, will be found to furnish most satisfactory characters. In figure 2, *a* indicates the oil-ducts, *b* the seed section, *c* the pericarp, *d* the commissural face. Frequently groups of thick-walled or smaller cells occur, usually subtending the ribs and even indicating their position in the absence of surface appearance. These groups, which will probably be helpful in classification, may be called "strengthening cells" for convenience.

In the following series of notes all the species east of the 100th meridian will be illustrated, at least by the tranverse section of the carpel.

SANICULA L.—Fruit globular, covered with hooked prickles: carpels without ribs, each with 5 oil-ducts (2 ventral and 3 dorsal) (figs. 1, 2 and 3).—One to three feet high,

with 3 to 7-parted leaves; radical long-petioled; cauline short-petioled or sessile; their divisions sharply cut and serrate. Involucre and involucels few-leaved. Flowers greenish or yellowish. May to August.

1. **S. Canadensis** L. Spec. 235. Leaf-divisions 3 to 5: sterile flowers comparatively few, short pedicelled: style shorter than prickles: oil-ducts mostly large, occupying nearly the whole thickness of the pericarp; seed-section deeply sinuous in outline (figs. 1 and 2).—Common throughout the region.

2. **S. Marylandica** L. Spec. 235. Leaf-divisions 5 to 7: sterile flowers numerous, longer pedicelled: style much longer than prickles: oil-ducts smaller, in thicker pericarp; seed-section nearly entire (fig. 3).—Common throughout the region.

OSMORHIZA Raf.—Fruit linear-oblong, long tapering at base, deeply grooved at commissure, bristly: carpels with 5 prominent primary ribs, each subtended by a well defined group of strengthening cells, section nearly pentagonal, no oil-ducts; seed-section more or less deeply concave on the inner face (figs. 4, 5 and 6).—One to three feet high, with aromatic roots. Leaves ternately compound; leaflets ovate, strongly toothed or cleft. Involucre and involucels few-leaved. Flowers white. May to June.

1. **O. longistylis** DC. Prodr. iv. 232. Slightly pubescent or smooth: styles slender, nearly as long as the ovary (not the fruit): seed-section deeply and broadly concave (figs. 4 and 5).—Throughout the northern states and westward.

2. **O. brevistylis** DC. Prodr. iv. 232. Villous pubescent: styles conical, very short: seed-section less deeply and more narrowly concave (fig. 6).—Throughout the northern states and southward to N. Carolina. It is a question whether the specific name *O. dulcis* Raf. may not have the prior claim. The western *O. nuda* Torr. has the seed-section still less concave and strengthening cells less developed and well represents a third member in the series as here arranged.

CONIOSELINUM Fisch.—Fruit oblong, flattened dorsally, smooth: carpels with 5 prominent primary ribs, the lateral ones extended into broad wings; oil-ducts 1 to 4 in the intervals, 4 to 8 on the commissural side; seed slightly concave on the inner face (figs. 7 and 8).—One to five feet high, sometimes smaller, smooth. Leaves 2 to 3-pinnately compound, with inflated petioles. Involucre and involucels few-

leaved, the former sometimes wanting, the latter awl-shaped. Flowers white. August to October.

1. **C. Canadense** Torr. & Gray, Fl. i. 619. Leaflets pinnatifid: lateral wings nearly as broad as the seed; oil-ducts 2 or 3 in the intervals, sometimes 1 or 4.—Swamps and cold cliffs from Vermont to Minnesota and northward, also southward along the high mountains to N. Carolina, and in Indiana.[1]

The discovery of a quantity of fine fruiting specimens has enabled us to make a careful examination of fruit characters. Bentham & Hooker have referred this species to Selinum, which is characterized by single oil-ducts in the intervals, rarely 2. Their decision, however was based upon immature fruit, while our recently collected specimens show 2 and 3 to be the usual number of oil-ducts in the intervals, sometimes 1, and rarely 4. This fact would put the species in Ligusticum as defined by Bentham & Hooker. Its characters of broad lateral wings, inflated petioles, and pinnately compound leaves, however, make it so distinct from our own Ligusticums that it seems proper to retain the genus Conioselinum for this species. Possibly Conioselinum Fischeri is properly referred to Selinum. C. Canadense, if it could be included under Selinum, would belong to the broad lateral-winged section Euselinum, but with the oil-ducts of Ligusticum it must either stand as an intermediate genus between Ligusticum and Selinum or these two genera must be merged into one. But Conioselinum is more closely related to the Angelica group than to the Selineæ. In fact, its broad lateral wings and only somewhat prominent dorsal and intermediate ribs at once separate it from Selineæ and include it among Angeliceæ even to a superficial observer, a relationship which the minute structure of the fruit confirms. It is a question whether it should not be included with Angelica and Archangelica in a single genus. The only characters which serve to separate it from them are the much more dissected foliage (which does not count for much) and the absence of prominent bundles of strengthening cells beneath each rib, especially conspicuous under the lateral ribs. These characters can be made to separate Conioselinum from the other members of the Angelica group, but whether they should be considered generic or sub-generic is a matter of doubt. It seems best for the present to consider this genus as intermediate in its characters between Selineæ and Angeliceæ.

[1] BOTANICAL GAZETTE, xi. 338.

ERIGENIA Nutt.—Fruit much flattened laterally, nearly round, notched at base and apex, thin between the incurved carpels, smooth: carpels very thin-walled, with 5 small primary ribs; oil-ducts one to several in the intervals, 9 to 11 on the commissural side, which is drawn out (neck-like in section) into the narrow commissure; seed-section deeply two-lobed on the inner side, longitudinal section semilunar (figs. 9 and 10).—Low, diffuse, glabrous, from a deep round tuber, in early spring. Leaves ternately decompound, segments oblong. Involucels foliaceous. Flowers white.

1. **E. bulbosa** Nutt. Genera, i. 188. Span or so high: leaves radical except those subtending the imperfect umbels.—W. New York and Pennsylvania westward into the Mississippi valley.

CRYPTOTÆNIA DC.—Fruit linear-oblong, flattened laterally, somewhat grooved at the commissure, smooth: carpels with 5 small obtuse primary ribs; a single oil-duct beneath each rib and in each interval, 2 to 4 on the commissural side, which also contains two bundles of strengthening cells (in addition to those of the carpophore) besides those subtending each rib; seed-section roundish, slightly concave on the inner face (figs. 11 and 12).—One or two feet high, smooth. Leaves thin, 3-foliolate. Involucre none; involucels minute or none. Flowers white. June to September.

1. **C. Canadensis** DC. Mem. Umbel. 42. Leaflets large, ovate, 2 to 4 inches long, pointed, doubly serrate, lower ones lobed: fruit often becoming curved.—Canada to Minnesota and south to N. Carolina and Mississippi.—In this species the carpellary walls have two distinct layers, the outer being almost made up of the very broad bundles of strengthening cells, the inner composed of a single layer of large parenchyma cells set palisade fashion, and in which the oil-ducts always occur (fig. 13). This peculiar character, differing from any other umbellifer studied, serves to strengthen the position of Cryptotænia as a genus distinct from Pimpinella, to which Bentham and Hooker consider it too closely allied, as in Pimpinella there is no such inner layer and the bundles of strengthening cells are very small and widely separated.

EXPLANATION OF PLATE I.—Fig. 1. Fruit of Sanicula Canadensis. Fig. 2. Section of carpel of same: *a*, oil-ducts; *b*, seed section: *c*, pericarp; *d*, commissural face. Fig. 3. Section of carpel of S. Marylandica. Fig. 4. Fruit of Osmorhiza longistylis. Fig. 5. Section of carpel of same. Fig. 6. Section of carpel of O. brevistylis. Fig. 7. Fruit of Conioselinum Cana-

dense. Fig. 8. Section of carpel of same. Fig. 9. Fruit of Erigenia bulbosa. Fig. 10. Section of carpel of same. Fig. 11. Fruit of Cryptotænia Canadensis. Fig. 12. Section of carpel of same. Fig. 13. Section of carpel wall of same. Figs. 1 and 4×2½; 7, 9 and 11×5; transverse sections× 27; 13×125.

BRIEFER ARTICLES.

Death of Dr. Wigand.—By the death of Prof. Albert Wigand, of Marburg, Hesse, the scientific world has lost a strong and able friend. He died in Marburg, October 22d, after a severe illness, at the age of sixty-five years. For many years he has held the position of professor of botany and director of the botanical garden connected with the university of that place. Being the only professor of botany in the university, his work was naturally subdivided; as director of the garden and lecturer in the pharmaceutical institute and of general botany, he had not much remaining time to devote to any one branch of the science, as so many German professors have done. Hence his name is not so well known to American scientists. Many of them, however, know him as one of the last of the German botanists who may be said to belong to the old school. In fact, it was his lot to live during one of the transition periods of science, and he was among the few who refused to fall in with the general current. He suffered from this more or less by the isolation which such conservatism always brings, but in no way did this serve to diminish his ardor for his work, or his usefulness in leading others to an enthusiasm in the pursuit of truth in a degree which few teachers are able to reach. Among the evidences of the former are numerous works and papers which he found time out of his busy life as teacher, from time to time to publish. In respect to the latter statement it is perhaps enough to say that he reckoned among his students such men as Eichler of Berlin, and Pfeffer of Tübingen. Whatever may be said concerning his peculiar views on certain points, it is quite certain no teacher could have been more careful and conscientious in presenting them to his hearers, simply as his own views, in carefully distinguishing between mere theories and established facts. Certainly none who ever came within the radius of his influence can doubt the sincerity of his character, his devotion to truth and entire consecration to its interests.—EMILY L. GREGORY.

The Genus Iris.—It is well known to botanists that Professor Michael Foster, the distinguished physiologist of the University of Cambridge, has for several years paid particular attention to the genus *Iris*, has in cultivation all the species and varieties he has been able to obtain, and has carefully studied the principal forms from seedling states through their whole development and in critical cases from generation to generation. He may be supposed now quite thoroughly to understand the Old World

species; and those of North America have not been neglected. But several are still in doubt or obscurity; and few of them, even those of the Atlantic States, have been sufficiently studied alive, although this is nearly indispensable. Professor Foster, according to the wishes of botanists who recognize the need of the undertaking and his unequaled fitness for it, is disposed to undertake an elaboration of the species; and he has appealed to me for aid in the difficult matter of procuring ripe seeds or living roots of certain American species and forms which are not in his extensive collection. He particularly wants I. tridentata and I. tripetala from the Atlantic side of our continent, I. Hartwegi, I. Beecheyana, I. macrosiphon, as well as two recent species of Watson, I. tenuis and I. bracteata, from the western portion. For these and for any other rare or local forms—for all wild Irises, except our common eastern species—an appeal is now made. Seeds and roots contributed to the botanic garden of our Cambridge will be thankfully received and cared for, and a goodly portion promptly transmitted to Professor Foster in Cambridge, England, where we may expect them to be fully investigated. For, in a letter to me Professor Foster writes, "I do not like to come to any conclusion about a plant until I have had it under my eyes alive, and know its whole story from seed to seed again. I mean I do not feel that I have really got hold of the form until I have done this, though of course one can learn a good deal short of that. Hence I am anxious to get hold of living plants. Your North American forms are most interesting when the morphology and geographical distribution are worked together, and in connection with the Asian forms."

Note that seed, to be of any good, should be thoroughly ripe; and that living roots are in best condition for transmission in early autumn.

ASA GRAY.

On petiolar glands in some Onagraceæ.—At a recent meeting of the Academy of Natural Sciences of Philadelphia, Mr. Thomas Meehan remarked that stipules were unknown in Onagraceæ, but in Ludwigia (Isnardia) palustris there were two minute conical gelatinous glands, at the base of each leaf, that appeared to be stipular. They existed in series of specimens representing the Atlantic and Pacific coast, and from Europe, those from California being larger than in specimens from other localities. They are found in all the species of Ludwigia and Jussiæa that he had been able to examine. In these they appeared petiolar rather than stipular. In the dried specimens of Circæa a dark spot indicated the position occupied by the glands in other species. They mostly varied in form and exact position with the species, and only for having been wholly overlooked by describers might have afforded some good specific characters. The discovery he regarded as interesting, as confirming the views of those botanists who had brought Turneraceæ, in which the petiolar glands were known to exist, in close relation with Onagraceæ.

In the specimens of Ludwigia palustris, dried to exhibit with this communication to the academy, a single capsule only, cut across for examination, projected the seed into his face while the capsule was being examined with a lens, indicating a projecting power not before known to exist in the species.—T. M.

The Square Bamboo.—Some of our readers may remember an article in *Nature*, for August 27, 1885, giving some account of the square-stemmed bamboo, which has recently been brought to light by Dr. Macgowan, who sent a notice of it, and also some living plants, to Kew. It appears to be a veritable species and not a monstrosity. Most of what is known about it is recorded by Dr. Macgowan, a medical missionary who has long lived in China, in the *Chinese Recorder*, April, 1885 and 1886. "It grows wild in the north-eastern portion of Yunnan, on the sequestered mountains." Dr. Macgowan last summer sent a beautiful cane made of it, with silver mounting, on which the name of Gray is inscribed in Chinese characters, and the interesting present reached the botanist to whom it was presented on the morning of his seventy-sixth birthday.

EDITORIAL.

THE BOTANICAL GAZETTE extends its best wishes to botanists for the new year and expects to record a year of unusual activity among American botanists. It is a time for good resolutions, and botanists should not be behind in this matter. The GAZETTE has made more good resolutions than ever before, but to carry them all out must depend in a large measure upon the hearty co-operation of fellow workers. The various associations of this country and our botanical periodicals have brought us together in a compactness of organization and friendliness of feeling that is the promise of great things. The resolution we would like to have each botanist make with the new year is to do some good work and see to it that none of it goes unrecorded. Our various departments furnish ample room for all forms of communication, large or small, formal or informal, and we want botanists to use them. We will try to keep our readers abreast of the work in this and other countries, but we want their co-operation in every direction. We would call attention to the department of "Notes and News," and ask all botanists to send us any unpublished scraps of information they may meet concerning the work or movements of botanists. Among "Open Letters" we would give place to any expressions of opinion, or any discussion that may be of general interest. In short, we welcome all botanists to all departments of the GAZETTE, excepting the editorial, and even that can be freely discussed in "Open Letters." It is hardly necessary to add that all departments of botany must feel absolute freedom in applying for space, and no one need complain of a failure to obtain a reasonable hearing.

PROBABLY no former report of the U. S. Commissioner of Agriculture has contained such a hopeful outlook for applied botany as that for 1886. Commissioner Colman deserves the credit of having brought this phase of agriculture into prominence as a subject of economic importance meriting development. His well chosen words in the report regarding the study of forage plants, the parasitic diseases of plants, and the biology of forest trees, as prosecuted during the past year, and the need of more ample provision for their continuance, will meet with the most hearty approval of every botanist who is interested in seeing the results and the methods of science turned to the service of the cultivator.

OPEN LETTERS.

Mr. C. G. Pringle.

On the twenty-seventh of November for a few hours I had the pleasure of the company of Mr. C. G. Pringle, of Charlotte, Vermont, who is on his way home from northern Mexico, where he has again spent the summer collecting plants. All who have seen his specimens know that he is a prince among collectors. He reports the season as unfavorable for his work, though he estimates that he has secured at least 1,000 species. Next year he anticipates going on to higher grounds in the same country. He thinks it is a rough, dangerous way to live, some of the time among people who would not hesitate to kill him merely for his clothes, still he is full of enthusiasm and likes his work. There is a perpetual fascination in finding new things as well as in meeting with old friends among his plants. Mr. Pringle appeared in good health and spirits. The time passed too quickly to hear all he had to tell of his journey and his acquaintance with botanists in various parts of America.

Michigan Agricultural College. W. J. BEAL.

Herbarium Case.

In the herbarium case which was constructed for the Ark. Ind. Univ., to facilitate getting genus covers out of the pigeon holes, a two inch auger hole was bored in the bottom of each apartment in the center and one-half inch from the front. By inserting two fingers beneath the shelf the contents of the pigeon hole above are readily raised, and by slipping the other hand in, easily removed. This plan works nicely and has the merit of not disfiguring the front of the shelves, as the holes can not be seen, also leaves all the space on the front for labeling if desired.

Orono, Maine. F. L. HARVEY.

Dr. Edward Palmer.

Dr. Edward Palmer has just returned from Guadalajara, Mexico, where he has made a large and valuable collection of plants, which he will proceed to distribute among his patrons as soon as possible. He has also collected seeds of economic plants which he believes will be of value for cultivation in the arid districts of Texas, New Mexico and Arizona.

Washington, D. C. GEORGE VASEY.

CURRENT LITERATURE.

House Plants as Sanitary Agents; or, the relation of growing vegetation to health and disease, comprising also a consideration of the subject of practical floriculture, and of the sanitary influences of forests and plantations. By J. M. Anders, M. D., Ph. D., etc. Philadelphia: J. B. Lippincott Co., 1887. 12°, pp. 334.

Dr. Anders is already known to many of our readers, through his papers on this subject in the *American Naturalist* and elsewhere. The present book is an amplification (we had almost said a diffusion) of those papers, with suitable changes and additions. The theses of the book are that house plants act as sanitary agents by (1) adding moisture to the air by transpiration; (2) producing ozone; (3) by their positive therapeutic value in certain diseases; (4) by their appeal to the æsthetic side of our nature. The latter claim no one will dispute. But it is not clear that house plants materially affect the quantity of ozone in the dwelling, nor do the experiments of the author at all demonstrate this. Indeed they seem to be rather indefinite, and read too much like experiments carried on to prove a previously assumed theory. Equally questionable also is the therapeutic value of ordinary house plants. The conclusions from the facts are not necessary ones, because of the innumerable opportunities for the action of other causes. It is well known how difficult it is to determine the therapeutic value of a substance administered directly; how much more to determine the value of one factor in a patient's environment!

We may concede the value of house plants in increasing the percentage of moisture in the air of a room, but it is questionable whether the effect of forests is appreciable in this direction. Indeed the whole question of the influence of forests on climate must be considered as yet problematical. Throughout the book the author has shown himself possessed by his subject, and he has ransacked every nook and corner to find support for his main idea. The reader must, therefore, estimate for himself the relative values of the authorities quoted, and must take with a grain of allowance many of the deductions.

Aside from slack proof-reading, the book is well manufactured.

Zur Systematik der Torfmoose, von Dr. Julius Röll in Darmstadt. Separat-Abdruck aus *Flora*, 1885, 1886. 8°. pp. 108.

We have already noticed the publication of this work as it appeared in *Flora* (see this journal, 1886, p. 127). It now appears as a reprint in pamphlet form, and unfortunately re-paged. We shall, in the next number, describe the original paging, so that those who have occasion to quote from it may not be confused by this alteration.

The author first establishes what can hardly be controverted, viz the great variability of the characters used for specific distinctions, and

insists that the peat-mosses (Sphagna) do not show either constant species or typical forms, the intermediate forms being of equal value with the so-called typical forms. Instead of the present so called species, he would therefore establish "form-series" (*Formenreihen*), which should be distinguished by the most easily recognizable characteristics. Since these distinctions between form-series would be at best conventional, he thinks they should be settled by a committee of sphagnologists.

The bulk of the paper is made up of the description and arrangement of such form-series as seem to him best characterized. Almost an infinite number of forms are recognized and described. For example: under *Sphagnum acutifolium* Ehrh. (*in part!*) are placed *twelve varieties and thirty-seven forms!* Now as a matter of biological research this is all very well, and it certainly shows exhaustive study on the part of the author, not only in the closet but in the field. But as a practical system of classification we can not see that it is a marked improvement upon previous works. Every systematist surely regards his species as a series of forms more closely related to each other than to those of another form-series. But few would hold that these forms are sufficiently fixed or permanent to be worth describing, and still fewer will believe that they are definite enough to be recognizable by others. And this last is the sole object of descriptive botany!

Catalogue of Canadian Plants. Part III.—Apetalæ. John Macoun, Dominion Botanist. Geol. and Nat. Hist. Survey of Canada.

This part completes the exogens and the first volume of this fine catalogue. The Gymnosperms are in their proper place, and the genus Salix (of which there is, of course, a large display of species) shows the help of Mr. Bebb, as do all the rest of the Apetalæ the assistance of Dr. Gray and Mr. Watson. A large portion of this part is taken up with additions and corrections to former parts, and a complete index places this volume in a most compact shape for use. Prof. Macoun is to be congratulated upon so successful a conclusion, and has the wishes of American botanists that the second volume may not be long delayed.

Die Formen der Bakterien und ihre Beziehungen zu den Gattungen und Arten. Von Dr. Ferdinand Hueppe. Wiesbaden: C. W. Kreidel. 1886. 8°. pp. 152. Illustrated.

It is as essential in bacteriology, as in other departments of natural science, to possess a solid morphological basis in order to accurately interpret physiological and biological data. So much study is at present devoted to questions of great pathological moment that utilitarian and scientific interests alike suffer for want of well established fundamental conceptions of the morphology of bacteria. In this work treating of "forms of bacteria and their relation to genera and species," the author proposes to suppy the need, so far as present information permits.

The work is dedicated to Drs. Ferdinand Cohn and Anton DeBary,

and historically is mainly concerned with the growth of bacterial concepts from the time of Cohn's *Untersuchungen* to DeBary's *Vorlesungen*, 1872 to 1886. A few words are given to the early history of the subject, beginning with Leeuwenhoek, the discoverer of bacteria (1675), after which the epoch-making classification of Cohn (1872) ushers in the discussion of the comparative value of natural-history species, form species and physiological species.

The readiness with which certain bacteria pass from one form to another early attracted attention, and shook the belief in specific distinctions, raising the question, if various forms were not simply phenomena of growth, and if all bacteria should not be relegated to a single species or genus. The subsequent idea of monomorphic and pleomorphic forms led to expansion of the bacterial concept, and reinstated the idea of the existence of genuine species. Variability, the modifications due to change of function and of food supply, the significance of zoögloea, the several classes of growth-forms, and the formation and germination of spores, successively receive attention, followed by a classification of genera on the basis of fructification, and a discussion of the phylogenetic relationship of bacteria.

Such in brief is the outline of the work. Only a consultation of the work itself, however, can adequately reveal the full yet careful handling which the subject has received. It is an excellent treatise, and will prove a welcome one to a wide circle of readers and students.

NOTES AND NEWS.

TSUGA CAROLINIANA Eng. is figured in *Gardeners' Chronicle*, December 18, 1886.

MR. MATSUMURA, professor of botany in the Imperial University of Japan, is a pupil of Dr. Sachs.

WE ARE ABLE to give, in the present number, a short account of Dr. Wigand as a botanist and teacher, from the pen of one of his pupils.

DR. T. J. W. BURGESS has published in a quarto pamphlet of 10 pages (reprinted from Trans. Roy. Soc. Canada), recent additions to Canadian Filicineæ.

A NEW WORK on the "Fresh-water Algæ of the United States," by Rev. Francis Wolle, is in press. It will contain 150 plates, with over 2,000 figures.

THE CELERY FUNGUS (Puccinia bullata), during this last autumn, has been very prevalent in parts of England, in some cases every plant in a market garden being swept off by it.

DR. CHAS. E. BESSEY describes (*Am. Nat.*, Dec., 1886,) Psoralea tenuiflora as "another tumble-weed," occupying "ditches by the side of the railway," in S. Nebraska, in great masses.

DR. PAUL MORTHIER, of Neuchâtel, Switzerland, is dead. He was the founder of the Swiss Botanical Society, and has had the honor of being remembered in a familiar genus of fungi.

PROFESSOR RODOLFO LANCIANIA, of Rome, delivers a course of lectures on Roman archæology at the Johns Hopkins University during January, the second one of which is devoted to the flora and parks of ancient Rome.

THE FACT that some ovaries swell and ripen without ripening seed finds an explanation in the suggestion that the pollen-tube lives as a parasite upon the cells of the style, and so causes an extra flow of nourishment.

H. N. RIDLEY has concluded his list, in the *Journal of Botany*, of the monocotyledonous plants of New Guinea, collected by Mr. H. O. Forbes. New species abound, interesting among which are two new palms, and two new screw pines.

THE ENGLISH fungus forays for 1886 proved less successful than usual, owing to a scarcity of fungi and unpropitious weather. The Essex Field Club appears to have done the best, although the two days' search had to be made under umbrellas.

DRUGS AND MEDICINES for September, No. 2 of Vol. 2, has recently appeared, and, as heretofore, is a mine of botanical and medical information. The last part of the article on Magnolia, the first on Lobelia, and all on Asimina, fill up the number.

DR. H. G. BEYER, U. S. N., has been verifying and extending the researches of Hueppe and Lister on the microbe of lactic acid fermentation, which he thinks has to do with the souring of milk, while Laurent of Belgium has been studying the microbe of bread fermentation, called Bacillus panificus.

THE AMERICAN (formerly Michigan) Horticulturist has been merged into the *Popular Gardening*. Under the editorship of Mr. Charles W. Garfield, the eminent horticulturist, it was a valuable journal, giving promise of future growth and usefulness, and his dismissal was a calamity from which it did not recover.

In *Gardeners' Chronicle* for Dec. 11 (1886), Abies Lowiana is figured and described. In Bot. Calif. ii. 118. it is included under A. concolor. Prof. Sargent suggests that A. grandis may be but one variable species, including the typical or coast form, the Californian form (A. Lowiana), and the Utah and Colorado form (A. concolor).

WE ARE SORRY to learn that, by a fire in a Chicago bindery, Dr. L. M. Underwood has lost all the remaining copies of the second edition of his "Our Native Ferns." As all the bound copies have been sold, the book is now out of print. We hope that the demand for this excellent work will encourage the author to prepare a third edition.

DR. ALFRED R. WALLACE, who shares the honor with Charles Darwin of originating the theory of natural selection, recently delivered four lectures at the Peabody Institute at Baltimore, on the theory of development and the origin and uses of color in animals and plants, part of the fourth lecture being devoted especially to plants.

IN A PAPER read at the recent Potato Tercentenary Conference, published in *Gardeners' Chronicle*, Dr. J. G. Baker states that the five distinct species of Solanum which are tuber-bearing, are all natives of America. Two of them (S. tuberosum and S. Jamesii) are from our Rocky Mountain region, the first extending into S. America, two (S. cardiophyllum and S. oxycarpum) are Mexican, the remaining one (S. Commersoni) South American.

THE FIRST annual report of the forest commission of New York for 1885, published a short time since, contains, besides other valuable matter, an appendix giving a list of works on forestry to be found in ten of the chief libraries of the country, covering thirty-six pages, and nearly a hundred and fifty additional titles of magazine articles.

DR. BESSEY calls attention to the fact that the roughness of certain uredospores can only be seen when mounted dry. His attention was called to the fact by a student's difficulty in seeing the prickly wall of the uredospores of Puccinia coronata when mounted in water. When mounted dry the prickles appeared with great distinctness.

TWO LARGE American walnuts (Juglans nigra) are growing near London, according to a correspondent of the *Gardeners' Chronicle*, which measure 129 inches each in circumference, at four feet from the ground, and remain nearly the same size for fully fifteen feet upward, the total height of the trees being between 90 and 100 feet. This exceeds the size of this species mentioned in Michaux's Sylva.

THE MADAGASCAR lattice-leaf, Ouvirandra fenestralis, grows and flowers at Kew, with leaves nearly a foot long. A plant in the conservatory of Cornell University has leaves about half as long, but it is found difficult to keep them sufficiently free from unicellular algæ and fine sediment for healthy growth. The plant, besides being rare and beautiful, is morphologically interesting on account of its perforated leaves.

MR. C. E. BROOME, F. L. S., an associate of the Rev. M. J. Berkeley in cryptogamic studies, and a careful observer of English fungi, died November last, aged 74 years. The record of his scientific work in the publication of new species, conjointly with Mr. Berkeley, began in 1848, in the *Annals of Natural History*, and continued in that journal and *Grevillea* till near the time of his death. Although a man of admirable parts, his retiring disposition kept him a stranger to all but immediate neighbors and associates.

MR. F. H. KNOWLTON has distributed, as a reprint from the Proc. Biol. Soc. of Washington (D. C.), Vol. III, additions to the flora of Washington and vicinity, as supplementary to Ward's "Guide to the Flora of Washington and vicinity." It is divided into six parts, as follows: 1. List of vascular plants added, numbering 35 species, besides 4 hybrid oaks; 2. Revision of the Musci and Hepaticæ, by Rev. E. Lehnert; 3. List of lichens, by the same author; 4. Changes in nomenclature; 5. New localities for rare species; 6. Species excluded, 4 in number.

A VERY INTERESTING PAPER by Prof. C. S. Sargent, in the *American Journal of Science* for December (1886), gives some account of the journey of André Michaux to the high mountains of Carolina, in December, 1788. This journey was to collect living plants of Magnolia cordata, a species which no botanist of the present century has discovered in a wild state. From Prof. Sargent's investigations it seems certain that Michaux's M. cordata, as known in gardens, is a rare and local variety of M. acuminata, and as such Prof. Sargent describes it. Tracing Michaux's journey in search of this form, the rare Shortia galacifolia was rediscovered, undoubtedly referred to by Michaux as "*Arbuste*," with "*f. denticulées.*" In a note appended to Prof. Sargent's paper, Dr. Gray announces the rediscovery of Shortia at another station in the vicinity, where there were "rods covered with it." It looks as if this rarest of plants is at last found in sufficient abundance to insure its continuance, as well as to enable botanists to obtain specimens of it at a reasonable expense.